AQUATIC INVERTEBRATES AND HABITAT AT A FIXED STATION ON THE MUSSELSHELL RIVER, GARFIELD COUNTY, MONTANA

July 10, 2001

A report to
the Montana Department of Environmental Quality
Helena, Montana

by
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INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Musselshell River near Mosby, Montana on July 10, 2001. The sample site was located by GPS reading at 46° 59' 38" N, 107° 53' 23" W, lying within the Northwestern Great Plains Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of a composite of four Hess samples. Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the method recommended by Bukantis (1998) for streams of Montana's Plains ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity. Results from the application of other metric batteries may be found in the Appendix.

RESULTS AND DISCUSSION

Table 1 itemizes the evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored sub-optimally for this site on the Musselshell River. Flow conditions at the site were very poor, compromising use of the Hess sampler. Riffle habitat was virtually non-existent, likely also making sampling difficult. Substrate particle size diversity was perceived to be sub-optimal, and embeddedness affected substrate to some extent. Some channel alteration was observed. Streambanks were judged moderately unstable, with disruption of vegetative protection apparent.

Table 1. Stream and riparian habitat assessment for a fixed station on the Musselshell River. July 2001.

Max. possible score	**Parameter**	Musselshell River near Mosby
10	Riffle development	1
10	Benthic substrate	8
20	Embeddedness	12
20	Channel alteration	14
20	Sediment deposition	18
20	Channel flow status	1
20	Bank stability: left / right	5 / 5
20	Bank vegetation: left / right	8 / 8
20	Vegetated zone: left / right	8 / 9
160	Total	97
	Percent of maximum	**61**
	CONDITION*	**SUB-OPTIMAL**

*Condition categories. Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

Table 2. Metric values, scores, and bioassessment for a fixed station on the Musselshell River. The Montana DEQ bioassessment metric battery recommended for streams of the Plains ecoregions (Bukantis 1998) was used for the evaluation. July 2001.

	Musselshell River near Mosby	
METRICS	**METRIC VALUES**	**METRIC SCORES**
Taxa richness	25	3
EPT richness	8	2
Biotic index	5.53	2
% Dominant taxon	15.58	3
% Collectors	44.86	3
% EPT	38.01	2
Shannon diversity	3.20	3
% Scrapers and Shredders	28.04	2
Predator taxa	6	3
% Multivoltine	32.40	3
	TOTAL SCORE (max.=30)	26
	PERCENT OF MAX.	87
	Impairment classification	**NON-IMPAIRED**
	USE SUPPORT	**FULL**

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Musselshell River is non-impaired and fully supports designated uses

Despite perilously low flow conditions and difficulty using the Hess sampler, 25 taxa were collected in the sampling effort and numbers were adequate for bioassessment. Many of the taxa present in the sample are rheophiles, including the heptageniid mayfly *Leucrocuta* sp. and the caddisflies *Cheumatopsyche* sp. and *Hydropsyche* sp.; thus, some flow persisted at the site.

The biotic index value (5.53) was moderately elevated, and only 4 mayfly taxa were collected, still, mayflies accounted for 24% of all animals in the sample. These findings suggest that there may have been some mild nutrient enrichment at the site, or that warm water temperature influenced the composition of the benthic fauna. It is likely that both factors played roles.

Warm temperatures and nutrient enrichment are conducive to the development of anoxic conditions in the substrate, and there is evidence that such conditions existed at this site; hemoglobin-bearing midges were abundant in the sample. These included *Pseudochironomus* sp., *Cryptochironomus* sp., *Dicrotendipes* sp., and others. Filamentous algae seem also to have been present, since the caddisfly *Hydroptila* sp. was common.

Long-lived organisms were represented by 30 individuals in a single taxon, the elmid *Ordobrevia* sp. With limited mobility and mediocre drift tendency, these beetles are not likely to be recent colonizers, and thus suggest that catastrophic dewatering has not interrupted their long lives.

CONCLUSIONS

- Warm water and nutrient enrichment influenced the benthic fauna, and may have aided in the development of anoxic conditions in the sediments. Low flow conditions likely exacerbated these effects.
- Performance of the metric battery used here probably does closely reflect biotic health at this site, despite the fact that dewatering has clearly impacted the river at this site. More water in the channel would likely cool temperatures and dilute nutrients significantly.

LITERATURE CITED

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs) Reston, Virginia. US Geological Survey.

APPENDIX

Taxonomic data and summaries

Musselshell River

July 2001

Aquatic Invertebrate Taxonomic Data

Site Name: Musselshell River near Mosby **Date: 7/10/01**

Site ID: M26MUSSR01 Approx. percent of sample used: 27

Taxon	Quantity	Percent	HBI	FFG
Nematoda	2	0.62	11	PA
Limnodrilus hoffmeisteri	2	0.62	10	CG
Physidae	50	15.58	8	SC
Acari	1	0.31	5	PA
Total Misc. Taxa	**55**	**17.13**		
Caenis sp.	4	1.25	7	CG
Leucrocuta sp.	37	11.53	4	SC
Choroterpes sp.	32	9.97	2	CG
Isonychia sp.	4	1.25	2	CG
Total Ephemeroptera	**77**	**23.99**		
Isogenoides sp.	1	0.31	3	PR
Total Plecoptera	**1**	**0.31**		
Trichocorixa borealis	4	1.25	10	PR
Ambrysus mormon	1	0.31	3	PR
Total Hemiptera	**5**	**1.56**		
Cheumatopsyche sp.	22	6.85	5	CF
Hydropsyche sp.	1	0.31	5	CF
Hydroptila sp.	21	6.54	6	PH
Total Trichoptera	**44**	**13.71**		
Ordobrevia sp.	30	9.35	5	CG
Total Coleoptera	**30**	**9.35**		
Ceratopogonmae	1	0.31	6	PR
Simulium sp	2	0.62	5	CF
Total Diptera	**3**	**0.93**		
Cricotopus Bicinctus Gr.	7	2.18	7	CG
Cryptochironomus sp	2	0.62	8	PR
Dicrotendipes sp.	14	4.36	8	CG
Paratanytarsus sp.	7	2.18	6	UN
Polypedilum sp	3	0.93	6	SH
Pseudochironomus sp.	1	0.31	5	CG
Tanytarsus sp.	25	7.79	6	CF
Thienemanniella Gr	47	14.64	5	PR
Total Chironomidae	**106**	**33.02**		
Grand Total	**321**	**100.00**		

Aquatic Invertebrate Summary

Site Name: Musselshell River near Mosby **Date: 7/10/01**

SAMPLE TOTAL	321
EPT abundance	122
TAXA RICHNESS	25
Number EPT taxa	8
Percent EPT	38 01

Site ID: M26MUSSR01

DOMINANCE

TAXON	ABUNDANCE	PERCENT
Physidae	50	15 58
Thienemannimyia Gr	47	14 64
Leuctrocuta sp	37	11 53
Choroterpes sp	32	9 97
Ordobrevia sp	30	9 35
SUBTOTAL 5 DOMINANTS	196	61 06
Tanytarsus sp	25	7 79
Cheumatopsyche sp	22	6 85
Hydroptila sp	21	6 54
Dicrotendipes sp	14	4 36
Cricotopus Bicinctus Gr	7	2 18
TOTAL DOMINANTS	285	88 79

SAPROBITY

Hilsenhoff Biotic Index	5 53

DIVERSITY

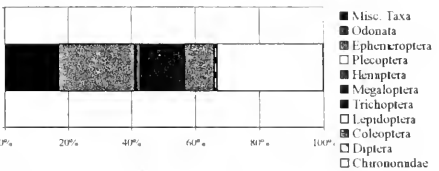
Shannon H (loge)	2 22
Shannon H (log2)	3 20
Simpson D	0 09

VOLTINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	104	32 40
Univoltine	187	58 26
Semivoltine	30	9 35

TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc Taxa	17 13	4	55
Odonata	0 00	0	0
Ephemeroptera	23 99	4	77
Plecoptera	0 31	1	1
Hemptera	1 56	2	5
Megaloptera	0 00	0	0
Trichoptera	13 71	3	44
Lepidoptera	0 00	0	0
Coleoptera	9 35	1	30
Diptera	0 93	2	3
Chironomidae	33 02	8	106

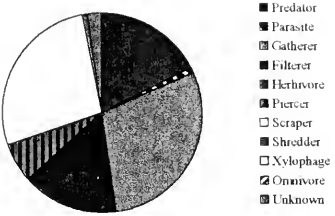


TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	7	145	45 17
Intolerant	0	0	0 00
Clinger	9	148	46 11

FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	17 45	6	56
Parasite	0 93	2	3
Gatherer	29 28	8	94
Filterer	15 58	4	50
Herbivore	0 00	0	0
Piercer	6 54	1	21
Scraper	27 10	2	87
Shredder	0 93	1	3
Xylophage	0 00	0	0
Omnivore	0 00	0	0
Unknown	2 18	1	7



BIOASSESSMENT INDICES

B-IBI (Karr et al.)

METRIC	VALUE	SCORE
Taxa richness	25	3
E richness	4	1
P richness	1	1
T richness	3	1
Long-lived	1	1
Sensitive richness	0	1
%tolerant	45 17	3
%predators	17 45	3
Clinger richness	9	1
%dominance (3)	41 74	5
	TOTAL SCORE	20

40 %

MONTANA DEQ METRICS (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	25	3	2	2
EPT richness	8	2	0	0
Biotic Index	5 53	2	1	0
%Dominant taxon	15 58	3	3	3
%Collectors	44 86	3	3	3
%EPT	38 01	2	1	0
Shannon Diversity	3 20	3		
%Scrapers +Shredd	28 04	2	2	1
Predator taxa	6	3		
%Multivoltine	32 40	3		
%H of T	52		3	
TOTAL SCORES		26	15	9
PERCENT OF MAXIMUM		86 67	62 50	42 86
IMPAIRMENT CLASS		NON	SLIGHT	MODERATE

COMMUNITY TOLERANCES

Sediment tolerant taxa	2
Percent sediment tolerant	16 20
Sediment sensitive taxa	0
Percent sediment sensitive	0 00
Metals tolerance index (McGuire)	3 18
Cold stenotherm taxa	0
Percent cold stenotherms	0 00

Montana DEQ metric batteries